Sept. 13, 1960 S. URBAN 2,952,132

AUTOMATIC DROP HAMMER FOR SOIL TEST BORING

Filed July 5, 1956

Fig. 2

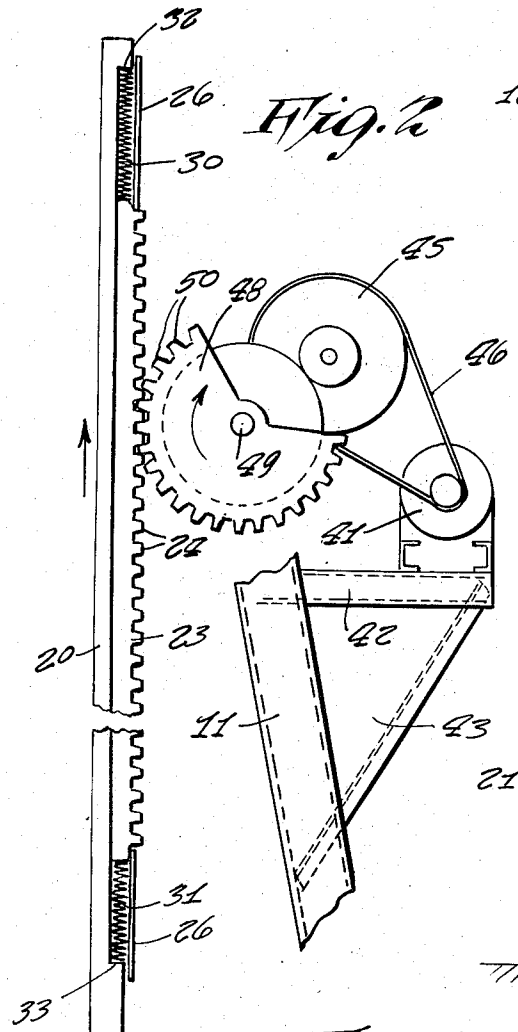


Fig. 1

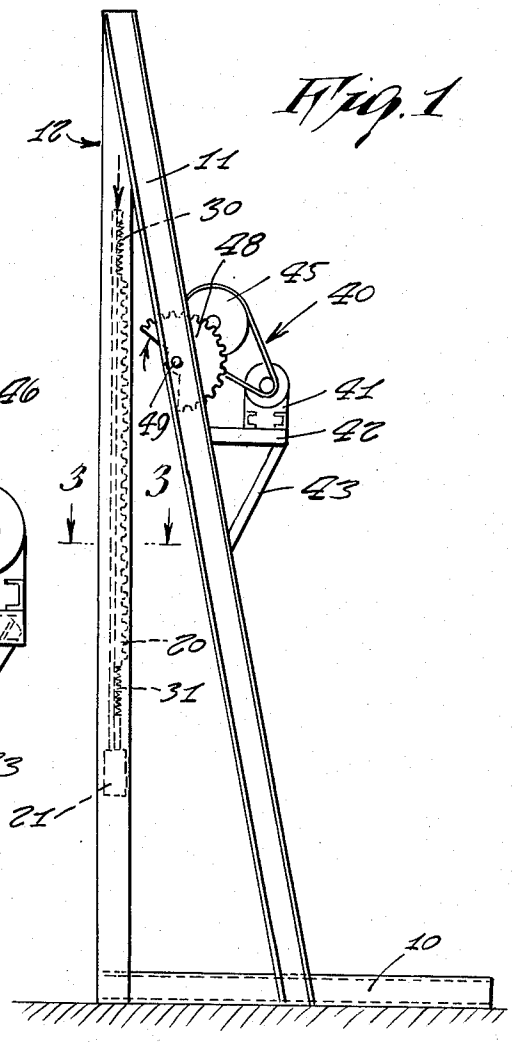
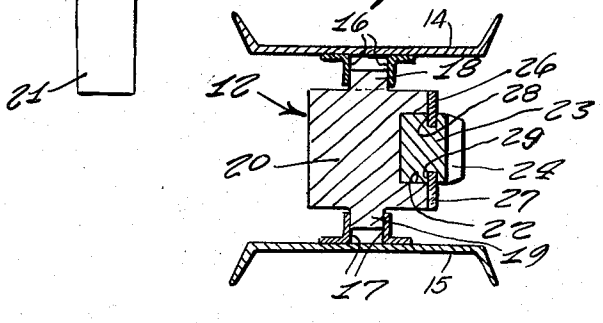


Fig. 3



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AUTOMATIC DROP HAMMER FOR SOIL TEST BORING

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1 Claim. (Cl. 61—73)

This invention relates to mechanical hammers and, more particularly, to power operated drop hammers for soil test boring.

Heretofore, various types of hammer devices have been used in connection with soil test borings, pile driving, well drilling operations, and the like. However, because of variations in the regularity of the hammer blows and the introduction of various errors by the operator, the speed, accuracy, and general dependability of these devices have varied. An object of this invention, therefore, is to provide an automatic drop hammer assembly that is simple in construction, efficient in operation, and which will overcome all of the aforementioned difficulties.

Still another object of this invention, is to provide an automatic drop hammer particularly suitable for soil test boring that provides precision drop height and drop weight, regularity of hammer blows and the elimination of operator introduced errors.

All of the foregoing and still further objects and advantages of this invention will become apparent from the following specification, taken in connection with the accompanying drawing, wherein:

Figure 1 is a side view of a drop hammer assembly made in accordance with this invention shown with the hammer in a descending position;

Figure 2 is a fragmentary view of Figure 1 showing the hammer being lifted; and

Figure 3 is a cross-sectional view taken along line 3—3 of Figure 1.

Referring now to Figure 1 of the drawing, a drop hammer made in accordance with this invention is shown to include a ground engaging base **10** having a pair of angularly and inwardly inclined side arms **11** that are adapted to support a vertical hammer assembly **12** therebetween. As more clearly shown in Figure 3, the hammer assembly **12** includes a pair of spaced, vertical, channel members **14, 15**, each of which has a pair of inwardly extending angle members **16, 17**, respectively. These angle members **16, 17**, define channels for slidably receiving the side rails **18, 19**, of the vertically disposed hammer shaft **20** that operatively supports the hammer head **21** at its lower extremity. One side of the shaft **20** is provided with a vertical, longitudinally extending groove **22** that slidably receives an elongated rack gear **23**, having a plurality of longitudinally spaced teeth **24**. The gear **23** is maintained in engagement with the shaft **20** by means of a pair of guide and securing plates **26, 27**, that are secured to the shaft **20** and are slidably received within matching grooves **28, 29**, in the sides of the rack gear **23**. The rack gear **23** is spring biased in both longitudinal directions by means of springs that act at each longitudinal extremity thereof. As more clearly shown in Figure 2, an upper compression spring **30** reacts against a shoulder **32** formed at the upper end of the hammer shaft **20** at one end and abuts the upper end of the rack gear **23** at its other end. Similarly, a lower compression spring **31** reacts between the lower shoulder **33** and the lower end of the rack gear **23**.

An actuator assembly **40** is operatively supported on the supporting frame adjacent to the rack gear assembly. A motor **41** is supported on a horizontal platform carried by the side arms **11** and reinforced by a gusset **43**. An idler shaft assembly **45** driven by the motor through a friction belt **46** is in driving engagement with a sector gear **48** that is mounted on a shaft **49** carried by the side arms **11** and has a plurality of teeth **50** adapted to engage the teeth **24** of the rack gear.

In operation, the motor is energized whereupon the sector gear **48** is continuously rotated in a clockise direction so as to intermittently engage the teeth **24** of the rack gear. As the gear **48** rotates in the clockwise direction as viewed in Figure 2, the rack gear is urged upwardly against the action of the upper spring **30** until it is fully compressed, whereupon the entire hammer shaft **20** is raised, thereby lifting the attached hammer shaft **21**. When the blank part of the gear **48** approaches the rack gear, the entire hammer shaft **20** is caused to drop by gravity so that upon impact, the rack gear **23** continues downwardly against the reaction of the lower spring **31**, compressing the spring which then lifts the rack gear **23** vertically, and after which the first teeth **50** of the gear sector **48** again approach the teeth **24** of the rack gear and engage therewith so as to continue the lifting movement of the entire shaft **20**, as described. Because of the spring support of the rack gear, impact shocks at both extremities are absorbed, thereby also reducing stress on the gear teeth during the initial lifting engagement. It will, therefore, be recognized that due to the action of the upper and lower springs **30, 31**, the gear rack bounces back and forth which reciprocating movement facilitates the engagement of the first tooth of the sector gear in a self-locating full tooth grip.

While this invention has been described with particular reference to the particular form shown in the drawing, it is to be understood that such is not to be construed as imparting limitations upon the invention, which is best defined by the claim appended hereto.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

A mechanical hammer comprising, in combination, a base frame, a vertical hammer assembly having a vertical shaft supported for reciprocating vertical movement upon said frame, motor means carried by said frame for driving said hammer assembly, a vertical rack gear supported for reciprocating vertical movement upon said vertical shaft, a first compression spring seat at opposite ends between the upper extremity of said vertical shaft and the upper extremity of said vertical rack gear yieldably resisting relative movement between said vertical shaft and said vertical gear in one direction, a second compression spring seated at opposite ends between the lower extremity of said vertical shaft and the lower extremity of said vertical gear yieldably resisting relative movement between said vertical shaft and said vertical gear in an opposite direction, said motor means drivingly engaging said vertical rack gear, said motor means comprising a drive shaft, a second gear secured to said drive shaft for rotation within a plane common to a plane containing the teeth of said rack gear, said sector gear having a toothed portion with teeth rotatable into the path of movement of said rack gear for meshing engagement therewith during a portion of each revolution of said drive shaft, said sector gear releasing said rack gear during the other portion of each revolution of said drive shaft, whereby continuous rotation of said sector gear in a single direction is operative to elevate said rack gear during the first mentioned portion of each revolution of said drive shaft, upward movement of said rack gear being operative compressing said first compression spring acting between said upper extremities of said vertical shaft and

said vertical rack gear to elevate said vertical shaft, and disengagement of said rack gear during the second mentioned portion of each revolution of said drive shaft allowing said rack gear and vertical shaft to drop by gravity into striking engagement with a work piece, downward movement of said rack gear relative to said vertical shaft being limited by compression of said second compression spring acting between said lower extremity of said vertical shaft and said lower extremity of said vertical rack gear, said compression of said second compression spring returning said rack gear partially upwardly into engagement with said toothed portion of said sector gear for elevation by said motor means.

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